

Effect of apex flap on leading edge vortex breakdown and trajectory over low sweep delta wings

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This paper presents the results of recent investigation on vortex flow structure over non-slender and slender delta wings with leading edge sweep angles, $\Lambda=45^\circ$, 50° and 65° . A comprehensive investigation was conducted in open loop wind tunnel at Reynolds number ranging from, $Re = 247,000 - 445,000$. Seven-hole pressure probe measurements are presented for axial vorticity, axial velocity, vortex trajectory and pressure variations at various chord wise stations and angles of incidences. Weak and skewed leading edge vortices were formed over non-slender delta wings very close to wing surface with strong shear layer unlike slender delta wings. This suggests reliance of leading edge vortex breakdown and trajectory over apex region and apex flap can be used to control the vortex breakdown and trajectory over low sweep delta wings. Vortex trajectory for both types of wings showed strong dependency over angle of attack and wing nose alteration. Passive deflections of apex flap up to $\pm 10^\circ$ were used to control the leading edge vortices and to delay the vortex breakdown and stall angle. The results revealed that vortex breakdown was delayed by as much as 8% by apex flap deflection in non-slender delta wings.

Biography

Hafiz Laiq-ur Rehman is pursuing his Masters in Mechanical Engineering from McGill University. He completed his MS Process Engineering from Pakistan Institute of Engineering and Applied Sciences (PIEAS), Pakistan and in 2006. He has published one journal and four conference papers respectively.

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